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ABSTRACT

A curriculum pilot project was initiated for purposes of helping the Acoma and Laguna Pueblo Tribes (2 of 19 Pueblo Tribes located in New Mexico) to improve the education of their children. A majority of these students were bilingual and the overall educational program did not seem to meet their particular learning needs, resulting in poor academic achievement, standardized test scores far below grade level, high absenteeism, increasing drop-out rates, and curriculum programs that are insensitive to the needs of the bilingual/bicultural student. After a thorough investigation, it was ascertained that these students were experiencing greatest difficulty in mathematics, reading, and social studies and that the curricula used for these subject areas were not culturally relevant. In an effort to measure whether cultural relevance would improve learning, a comparison was made of "intact" classroom situations employing a conventional curriculum and those employing the culturally relevant pilot curriculum. The experimental groups employed culturally relevant materials and strategies designed to enhance learning for fifth grade students in mathematics and reading, seventh grade students in mathematics, and ninth grade students in social studies. Findings suggested that teacher training was an important variable contributing to the achievement of these American Indian students. Pre- and post-testing indicated that in almost every case where the materials were used correctly and the teacher had received training, the pilot curriculum produced significant improvements. (EB)

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CURRICULUM IMPROVEMENT FOR PUEBLO INDIAN STUDENTS: A PILOT STUDY

July 1980

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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For this pilot project the content areas of mathematics, social studies, and reading were selected as the subjects for potential curriculum improvement for Pueblo Indian students from the Acoma and Laguna reservations in New Mexico. The research reported herein was performed pursuant to a grant from the Department of Health, Education, and Welfare; the United States Office of Education. Points of view or opinions expressed are not necessarily those of the Department of Health, Education, and Welfare or the United States Office of Education.

The report consists of five sections: Section One contains the introduction, background information, and the hypothesis for the project. Section Two presents the program descriptions for each academic subject and participating grade level. Section Three describes the methods and procedures utilized to carry out analysis of the collected data and includes obtained results which are reported in table form. Section Four contains the results of questionnaires which students in the pilot groups completed concerning attitudes about school in general and opinions of the new materials used. Section Five presents a brief discussion and overview of this pilot project.

SECTION ONE

Introduction

In March, 1978, the All Indian Pueblo Council, Inc. received a grant from the Department of Health, Education, and Welfare to conduct a feasibility study for the creation of a new public school district in the State of New Mexico*. Thus, many project activities focused on the legal and financial viability of the proposed new district. About one year was needed to gather sufficient data to answer the critical questions which surrounded the viability of a new school district. However, in addition to school district feasibility activities, the project employed two full-time curriculum specialists to collect baseline data, to investigate student achievement and student needs, and to begin to formulate an approach or instructional design which would improve student performance. This report focuses on some of the curriculum activities and the findings which resulted from actual classroom experimentation. We believe the findings are encouraging and will be of interest to other professionals involved in curriculum development.

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*The All Indian Pueblo Council, Inc. (AIPC) is the umbrella organization for the 19 Pueblo Tribes of New Mexico. The AIPC central office is located at 1015 Indian School Rd. NW, Albuquerque, NM, 87197.

The curriculum pilot project was carried out to aid the Acoma and Laguna Tribes, two of the nineteen Pueblos in New Mexico, in pursuing educational improvement for their children. The Acoma Reservation is located sixty miles east of Albuquerque and encompasses approximately 245,500 acres. It is estimated that about 2,350 persons reside on the land grant and reservation. At the present time, most of the Acomas live in or between three farming communities of Anzac, Acomita, and McCartys. For ceremonial occasions, most of the Acoma families maintain second homes at Old Acoma or Sky City which is historically recognized as the oldest continuously inhabited city in the United States. The Acomas speak one of seven dialects of the Keresan language group.

The lands of the Laguna tribe, alongside I-40 about 45 miles west of Albuquerque, are adjacent to the Acoma Reservation. Most of the nearly 6,000 Lagunas live in or between the mother pueblo of Old Laguna and the satellite village settlements: Paquate, Mesita, New Laguna, Encinal, Seama, New York, Philadelphia, Pittsburgh, Paraje, and Casa Blanca. Considered as a whole, Laguna is the largest of the Keresan speaking pueblos.

The students participating in the curriculum pilot project live in the Acoma and Laguna rural farming and

ranching communities and are experiencing the impact of energy related industries. Many of their parents are employed in the nearby uranium mines and energy producing plants.

The majority of these students are bilingual and the overall educational program does not seem to meet the particular learning needs of these students. Poor academic achievement is commonplace, standardized test scores are far below grade level for all grades, absenteeism is high, the alarming drop-out rate continues to soar, and most of the curriculum programs do not seem to be sensitive to the needs of these bilingual/bicultural students.

The project curriculum staff generally believed that one of the major problems facing Indian students in today's educational system is the relevance of materials utilized in the classroom. After a thorough review of collected baseline data which included standardized test information and item analyses, local needs assessments, and an overview of curriculum offerings, it was learned that these students were experiencing the most difficulty in mathematics, reading, and social studies and were not using culturally relevant educational materials in these content areas.

In an effort to overcome these problems a pilot project was conceived that would allow the students to

study academic subjects in a fashion that would include the perspective of their cultural heritage. Furthermore in an attempt to improve student learning and retention by "tailoring" learning tasks in a directive fashion, materials and teaching techniques were designed to be more relevant and interesting for students than those conventionally used. Also, these bilingual/bicultural materials were designed in a manner that was thought to be more relevant to how the information would ultimately be utilized outside the classroom.

In an effort to measure whether this relevance would improve learning, the project used "intact" classroom situations where it was possible to compare a conventional curriculum (control situation) with the pilot curriculum (experimental situation). Analyses performed attempted to take into account any possible differences in pre-instruction achievement levels.

The specific hypothesis tested was:

> There will be no significant difference in the post-course achievement of the experimental and conventionally-taught students, when initial differences between the two groups have been adjusted with respect to initial knowledge of the selected subjects of study.

SECTION TWO

Program Descriptions

This experimental project consisted of programs designed to enhance learning of fifth grade students in mathematics and reading, seventh grade students in mathematics, and ninth grade students in social studies. These grade levels were selected with the cooperation of school administrators and to serve as representative grade levels of elementary, junior high, and high school. The complete program descriptions and procedures are summarized below.

Mathematics Pilot Study - Fifth Grade

I. Background Information:

The fifth grade mathematics pilot study was conducted at Sky City Community School, a federal day school (K-8) located on the Acoma Reservation. The pilot study was for four school weeks, from February 5 to March 2, 1979, and consisted of twenty class periods of fifty minutes each.

II. Control Group:

The control group was composed of eleven males and two females ranging in age from ten to twelve years. The children were Pueblo Indian students from Acoma Pueblo and attended Sky City Community

School. They were in a regular mathematics class and used a standard fifth grade mathematics textbook with no additional mathematical materials. They were administered the pretest on February 5 and 6 and the posttest on March 1 and 2.

III. Experimental Group

The experimental group was composed of fourteen males and ten females ranging in age from ten to twelve years. The children were Pueblo Indian students from Acoma Pueblo and attended the Sky City Community School. These students were in a regular mathematics class and used only the experimental materials. They were administered the pretest on February 5 and 6 and the posttest on March 1 and 2. Upon completion of the unit but after the posttest, this group also was administered a short questionnaire dealing with student attitudes.

IV. Approach and Materials:

The experimental materials consisted of a classroom teaching unit entitled "Pueblo Buying: Catalog Ordering" and a student activity booklet which included six instructional packets on addition, subtraction, computation of money amounts, and story problems. The unit contained objectives, skills, a unit plan, teaching packets, activities, teaching suggestions, student activity booklet, and sample

pre-posttests. These materials were used because of a belief in the premise that by relating mathematics to the daily lives of Pueblo Indian students they will be able to achieve a greater degree of mastery of addition, subtraction, computation of money amounts, and story problem solving.

Many adult Pueblo people engage in occupations which involve the ability and skills needed to use a catalog to order supplies and materials. Because the activities of ordering from a catalog involve basic mathematical computation, they were selected as the means of teaching and reinforcing the skills needed for addition, subtraction, computation of money amounts, and word problems.

A unique approach to introducing and teaching word problem solving skills was developed for use in teaching the unit because many Pueblo children experience difficulty not only in computation but in working mathematical word problems involving computation as well. To circumvent some of these difficulties and to build upon a specific learning style which is an educational strength of Pueblo culture, story problems were retitled "Storytelling Problems". Folk tales have been in use for a long time as an educational vehicle by this culture and were the prehistoric textbooks for Pueblo children.

Today, the tradition of oral storytelling is strong and students are familiar with this approach. Therefore, a problem such as ordering jewelry supplies from a catalog was selected and a story about ordering these items was developed.

Using appropriate storytelling techniques the teacher told or read the story to the students. The students had a written copy of the story in their activity booklets and were able to follow the story as it was read or told to them. The conclusion of the story involved a step-by-step approach designed to teach specific mathematical skills. The teacher guided the students through these instructional steps to reach the conclusion of the story. A practice set of problems incorporating the content of the story was provided for student drill. After this section was completed and checked students were directed to additional supportive activities which involved mathematics and/or the content of the story.

V. Pre-Posttests:

The pre-posttests were developed to measure four areas: 1) basic addition facts; 2) basic subtraction facts; 3) computation of money amounts; and 4) story problem solving. Each subtest consisted of twenty items. In administering these tests, the teachers of both groups were instructed to read the story problem solving subtest to the students to minimize

any reading difficulties.

VI. Questionnaire:

A short questionnaire of 22 items was administerd to the experimental group upon completion of the unit. This questionnaire consisted of general questions about mathematics and specific items about the experimental materials. The purpose of the questionnaire was to gather information about student attitudes concerning mathematics and the experimental materials.

VII. Training of the Experimental Group Teacher:

Three training sessions were conducted with the experimental group teacher before the pilot mathematics program began and consisted of an introduction to the materials, teaching strategies, and directions for administering the questionnaire, pretest and posttest. During the teaching of the unit, suggestions were given to the teacher and several classroom observations were conducted.

VIII. Treatment for the Experimental Group:

The teacher of the experimental group was given training in the use of the experimental materials before the pilot study began. The experimental group used the materials for four school weeks for twenty class periods of fifty minutes each during its regularly scheduled mathematics class. The pretest was administered on February 5 and 6 and the posttest on

March 1 and 2. The teacher read the subtest on the story problems to them. A short questionnaire about student attitudes also was given on March 2. No additional mathematics materials were used by the experimental group.

IX. Treatment for the Control Group:

The teacher of the control group received no training prior to the pilot study. The control group used the standard fifth grade mathematics text adopted by the school. The control group used the text for the same length of time as the experimental group used the experimental materials: four school weeks. Twenty class periods of fifty minutes each were held during the regularly scheduled mathematics class which was at the same time as the experimental group's class. The pretest was administered on February 5 and 6 and the posttest on March 1 and 2. The teacher read the subtest on story problems for the students.

Reading Pilot Study - Fifth Grade

I. Background Information:

The fifth grade reading pilot study was conducted at Sky City Community School, a federal day school located on the Acoma Reservation. The study was conducted from April 18 to May 10, 1979 and consisted of 17 class sessions of fifty minutes each.

II. Control Group:

The control group was composed of nine males and four females ranging in age from ten to twelve years. The children were Pueblo Indian students from Acoma Pueblo and attended the Sky City Community School. They were in a regular reading group and used a standard fifth grade reading textbook with no additional reading materials. They were administered the pretest on April 18 and the posttest on May 10.

III. Experimental Group:

The experimental group was composed of fourteen males and ten females ranging in age from ten to twelve years. The children were Pueblo Indian students from Acoma Pueblo and attended the Sky City Community School. These students were in a regular reading group and used only the experimental materials. They were administered the pretest on April 18 and the posttest on May 10. Upon completion of the unit and the posttest, this group also was administered a short questionnaire to survey student attitudes.

IV. Approach and Materials:

The experimental materials consisted of a classroom teaching unit entitled "Pueblo Reading: Word

Building" and a student activity booklet which included five instructional packets on root words, prefixes, and suffixes. The unit contained objectives, skills, a unit plan, teaching packets, activities, teaching suggestions, student activity booklet, and sample pre-posttests. These materials were used because of a belief in the premise that by relating reading to the daily lives of Pueblo students and their cultural heritage they will be able to achieve a greater degree of mastery of word building skills.

Pueblo students at the intermediate grade levels have difficulty with English word building skills and these difficulties are apparent by their scores on standardized tests. These English word building skills include the knowledge and use of root words, prefixes, suffixes, plurals, contractions, compounds, etc. The Keresan language also includes word building patterns and several of these word construction processes, such as adding prefixes and suffixes to a root word to modify its meaning, are similar to those used in English. Therefore, the knowledge and use of root words, prefixes, and suffixes were selected as the basic word building skills for this reading unit.

To provide a more concrete example of the abstract process of structural analysis, particularly

one which would be easily understood by these Pueblo students, the process of building a house was selected to illustrate the English word structure which involves prefixes, suffixes, and root words. Usually the Pueblo way of building a house is not planned with a blueprint but rather a large room sometimes is built first which will accomodate a large number of people. As the need for additional space arises other smaller rooms such as sleeping space and storage space are added. The larger rooms can be compared to the root word and the smaller rooms which are added later can be likened to affixes.

To present the example and the word building skills to these Pueblo students a story telling approach was developed for use in the teaching of this unit. Folk tales have been in use for a long time as an educational vehicle by this culture and were the prehistoric textbooks for Pueblo children. Today, the tradition of oral storytelling is strong and the developers of this unit believed that these students would be familiar and comfortable with this apporach. Therefore, to set the stage for the introduction of skills to be taught in each lesson a brief story situation was presented to the students. This story was read to the students by the teacher. The students had a written copy of this brief story in

their activity booklets and were able to follow the story as it was read to them.

After the stage was set a brief reading passage about the prehistoric Pueblo people called the Basketmakers was read silently by the students. Following the reading of this passage the teacher gave a step-by-step presentation of word building skills. Practice exercises were provided for student drill and as a diagnostic aid for the teacher. After this section was completed and checked the students were directed to other supportive activities which involved reading and/or the content of this story.

V. Pre-Posttests:

The pre-posttests were developed to measure three areas: 1) root words, 2) prefixes, and 3) suffixes. Each subtest consisted of twenty items. In administering the tests, the teachers of both groups were instructed to read only the directions to the students.

VI. Questionnaire:

A short questionnaire of 17 items was administered to the experimental group upon completion of the unit. This questionnaire consisted of general questions about reading and specific items about

the experimental materials. The purpose of the questionnaire was to gather information about student attitudes concerning reading and the experimental materials.

VII. Training of the Experimental Group Teacher:

One training session was conducted beforehand with the experimental group teacher and consisted of an introduction to the materials, teaching strategies, and the procedures for administering the questionnaire, pretest and posttest. During the pilot study suggestions were given and classroom observations were conducted.

VIII. Treatment for the Experimental Group:

The teacher of the experimental group was given training in the use of the experimental materials before the pilot study. The experimental group used the materials for 17 class periods of fifty minutes each during their regularly scheduled morning reading class. No additional reading materials were used by this group. The pretest was administered on April 18 and the posttest was administered on May 10, 1979. The teacher read the directions for each subtest to the students. A short questionnaire also was given on May 10 after the students had completed the posttest.

IX. Treatment for the Control Groups:

The teacher of the control group received no training prior to or during the pilot study. The control group used the standard fifth grade reading text adopted by the school. The text had lessons on root words, prefixes, and suffixes. The control group used the text for the same length of time and at the same time of day as the experimental groups: 17 class periods of fifty minutes each. The pretest was administered on April 18 and the posttest on May 10. The teacher read the directions for each subtest to the students.

Mathematics Pilot Study - Seventh Grade

I. Background Information:

The seventh grade mathematics pilot study was conducted at Laguna/Acoma Junior High School, a public school centrally located to the Pueblo of Laguna and the Pueblo of Acoma. The study was conducted for six school weeks from November 15, 1978 to January 16, 1979 and involved 24 class periods of fifty minutes each.

II. Control Group:

The control group was composed of seven males and eight females ranging in age from twelve to thirteen years. The students were from the Pueblo

of Laguna, and the Pueblo of Acoma and attend Laguna/Acoma Junior High School. They were in a heterogeneous seventh grade mathematics group and used a standard seventh grade mathematics textbook. No additional mathematic materials were used. The students were administered the pretest during the school week of November 16 and the posttest during the school week of January 15.

III. Experimental Group:

The experimental group was composed of three males and six females whose ages ranged from twelve to thirteen years. These students were from the Pueblo of Laguna and the Pueblo of Acoma and attended Laguna/Acoma Junior High School. They were in a heterogeneous seventh grade mathematics group and used only the experimental materials. They were administered the pretest during the school week of November 16 and the posttest during the school week of January 15. After the posttest was given, a short questionnaire on student attitudes was administered to this group.

IV. Materials:

The experimental materials consisted of a classroom teaching unit entitled "Pueblo Buying and Selling" and a student activity booklet which

included seven instructional packets on addition, subtraction, multiplication, division, computation of money amounts, and story problems. The unit contained objectives, skills, a unit plan, teaching packets, activities, teaching suggestions, student activity booklet, and sample pre-posttests. The materials were used because of a belief in the premise that by relating mathematics to the daily lives of these students from a rural area they will be able to achieve a greater degree of mastery of the four basic arithmetic operations, computation of money amounts, and story problem solving.

Because many students from this area have difficulty not only in computation but in working mathematical word problems which involve computation as well, a unique approach to introducing and teaching word problem solving skills was developed for use in teaching the unit. To circumvent some of these difficulties and to build upon a specific learning style which is a strength of this culture, story problems were retitled "Storytelling Problems". Folk tales have been in use for a long time in this area. Today, the tradition of oral story telling still exists and students are familiar with this approach. Therefore, a problem such as purchasing

silver or selling craft items was selected and a story about buying or selling was developed.

Using appropriate story telling techniques the teacher told or read the narration to the students. The students had a written copy of the narration in their activity booklets and were able to follow the story as it was read or told to them. The conclusion of the story involved a step-by-step approach designed to teach specific mathematical skills. The teacher guided the students through these instructional steps to reach the conclusion of the story. A practice set of problems incorporating the content of the story was provided for student drill. After this section was completed and checked, students were directed to additional supportive activities which involved mathematics and/or the content of the story.

V. Pre-Posttests:

The pre- posttests were developed to measure computation and story problem solving. The subtest on story problem solving consisted of 24 items. In administering these tests, the teachers of both groups were instructed to read the story problem solving subtest to the students to minimize any reading difficulties.

VI. Questionnaire:

A short questionnaire of 25 items was administered to the experimental group upon completion of the post-test. This questionnaire consisted of general questions about mathematics and specific items about the experimental materials. The purpose of the questionnaire was to gather information about student attitudes concerning mathematics and the experimental materials.

VII. Treatment for the Experimental Group:

No training was given to the experimental group teacher. Very simple instructions were given to the teacher concerning the administration of the pre-posttest measures and the questionnaire. The experimental group used only the seven instructional student packets during the 24 class periods of fifty minutes each which were held during their regularly scheduled mathematics class. The teacher read the story section of the packet to the students and then assigned the remainder of the packet as classwork. Each student worked through the packet. No correction of the students' work was done and the students did not receive any feedback. None of the teaching procedures or activities suggested in the teacher's unit was used. The pretest was administered during the school week of November 16 and the posttest during the school week of January 15. The teacher

read the subtest on story problems to the students. After the posttest was given, the questionnaire on student attitudes was administered.

VIII. Treatment for the Control Group:

The teacher of the control group received no training. The control group used the standard seventh grade mathematics textbook containing lessons on addition, subtraction, multiplication, division, and word problems. The control group used the text for the same length of time as the experimental group used the instructional packets: 24 class periods of fifty minutes each. Classes were scheduled during the regular mathematics class which was in the morning as was the experimental group's class. The pretest was administered during the school week of November 16 and the posttest during the school week of January 15. The teacher read the subtest on story problems to the students.

Social Studies Pilot Study - Ninth Grade

I. Background Information:

The ninth grade social studies pilot study was conducted at Laguna/Acoma Junior-Senior High School, a public school centrally located to the Pueblo of Laguna and the Pueblo of Acoma. The study extended over a period of 14 weeks and was conducted from January 9 to April 25, 1979.

II. Control Group:

The control group was composed of five males and five females ranging in age from fourteen to fifteen years. They were Pueblo Indian students from the Acoma Pueblo and the Laguna Pueblo and attended Laguna/Acoma Junior-Senior High School. They were enrolled in a regular social studies course entitled Southwest Mythology and Cultures. The students were administered the pretest on January 4 and the posttest on April 25.

III. Experimental Group:

The experimental group was composed of two males and six females ranging in age from fourteen to fifteen years. They were Pueblo Indian students from the Acoma and Laguna Pueblos and attended Laguna/Acoma Junior-Senior High School. These students were enrolled in a Title IV Keresan Directed Studies course. They were administered the pretest on January 5 and the posttest on April 25. Upon completion of this experimental unit and the post-test, this group also was administered a short questionnaire on student attitudes.

IV. Approach and Materials:

The experimental materials consisted of a classroom teaching unit entitled "Pueblo Prehistory"

and a student activity booklet which was divided into six sections. The teaching unit contained objectives, a unit plan, a teaching outline, student learning activities, English and Keresan vocabulary lists, student activity booklet, crossword and word-find puzzles, maps, timelines, field trip information, and suggestions for developing classroom environment materials, as well as suggestions for utilizing community resource people in the classroom. A list of resources and suggested student exploration trips also was included. A sample pre-posttest and sample teaching lessons for implementing the student learning activities completed the teaching unit.

The materials included in the teaching unit were designed and developed on the premise that many Laguna and Acoma students are familiar with their own Pueblo prehistory as related through oral tradition by elders within their respective communities. Much of the content of these tribal legends passed down through many generations, in quite a few cases, corresponds to what modern day archaeological evidence and study have revealed. Because of the close traditional ties which exist between modern day Pueblo life and past history and culture, the materials and activities were designed to provide

content that would be of high interest and familiarity to these students.

The learning activities developed for use in the classroom were designed because of a belief in the premise that by relating activities familiar to the students in modern day life to the prehistoric content being studied, the students would be able to achieve a greater degree of mastery in the content area, as well as specific skills development such as organizational, creative writing, research, discussion, and map skills.

Using the teaching outline as a guide, the teacher presented the content material orally to the students. Important information was outlined on the blackboard by the teacher following the format provided in the teaching unit. The students had a blank outline format in their activity booklets and were able to fill in their outlines as the teacher wrote on the board. The students were initially guided through this outline procedure by the teacher who continued to present orally all six parts of the unit. The students eventually outlined the remaining parts of the unit on their own without the aid of a written outline on the board.

Each part of the teaching unit contained English and Keresan vocabulary. The teacher selected those

words which were appropriate to the content information being presented. Then the teacher pronounced the words correctly, gave the definitions which the students entered into their activity booklets, and used them in sentences and the correct context of the material being presented. A review activity to reinforce English vocabulary was provided through various methods including directed reading activities. [illegible] practice for the Keresan vocabulary was provided through the use of language modeling by the teacher and language master machines.

Using the sample teaching guidelines for implementing the learning activities, the teacher introduced the activity and discussed the requirements and procedures of each activity with the students. The teacher served only as a guide to the students as they began to use their own imagination and creative skills to complete the activity. Several suggested activities were provided in the unit which covered areas of food, clothing, tools, occupations, and social and survival problems. Other activities included in the teaching unit were designed to reinforce student learning and expose students to the process of recording history as it occurs. These included formats and suggestions for utilizing community resource people in the

classroom and providing student exploration trips. An activity entitled "History in the Making" was designed for the purpose of documenting all class activities, visits by community resource people, and student exploration trips to archaeological sites and museums.

V. Pre-Posttests:

The pre-posttests were developed to measure four areas: 1) vocabulary, 2) time concepts, 3) map skills, and 4) content. In administering these tests, the directions were read to the students by one of the developers of the experimental materials, to minimize any reading difficulties or misunderstanding of the test instructions.

VI. Questionnaire:

A questionnaire of 38 items was administered to the experimental group upon completion of the unit and the posttest. This questionnaire consisted of general questions about social studies and specific questions about Pueblo history, culture, and language. The purpose of the questionnaire was to gather information about student attitudes concerning social studies and the experimental materials and activities.

VII. Training of the Experimental Group's Instructional Staff:

Due to the multi-faceted approach of the teaching unit, there was a need for extensive training in the use of materials and activities for the classroom teacher as well as the paraprofessional staff, two Pueblo teacher aides who spoke fluent Keresan. This training was completed during December and included a thorough discussion of the materials, content, English and Keresan vocabulary, student activities, teaching strategies, and teacher aid supportive techniques. Periodic training sessions and observations of instruction were held throughout the pilot study.

VIII. Treatment for the Experimental Group:

The teacher of the experimental group and the paraprofessionals were trained in the use of the experimental materials throughout the pilot study. The experimental group used only the experimental materials and activities for 14 weeks during their regularly scheduled morning class periods of 55 minutes each. The pretest was administered on January 5 and the posttest on April 25. A short questionnaire also was given after the posttest to collect student attitudes concerning social studies and the experimental materials.

IX. Treatment for the Control Group:

The teacher of the control group received no training piror to or during the pilot study. Because there was no standard text available the control group used only those reading materials duplicated for classroom use: stories and legends of the Southwest selected by the teacher. Additional supplementary materials used were teacher developed puzzles, vocabulary lists, timeline charts, and directed reading activities. The control group used these materials for the same length of time as the experimental group used the experimental materials: 14 weeks with class periods 55 minutes in length each morning the class was in session. The pretest was administered by one of the developers of the experimental materials on January 4 and the posttest on April 25. As with the experimental group, the pre-posttest directions were read to the students to minimize any reading difficulties or misunderstanding of the test instructions.

SECTION THREE

Analyses and Findings

Analyses of covariance procedures were utilized to test the proposed hypothesis that no difference would be found between conventionally taught students and students in the pilot project. Covariance procedures allowed the investigators to test for differences in posttest results while taking into account any differences that might exist prior to instruction as indicated by pretest scores. Also covariance procedures were chosen because they are particularly useful in situations such as those encountered in the pilot project. These procedures allow for the use of intact classrooms where randomization techniques cannot be used and subject matching procedures would severely limit the number of subjects available for study purposes. Tables 1 through 17 report the results of these analyses.

Results for Fifth Grade Mathematics

Five separate analyses were computed for the mathematics scores recorded by the fifth grade subjects. Results were examined for differences in overall posttest scores and for the subtests of basic addition, basic subtraction, computation, and story problems. In each of these cases pretest scores were utilized as the covariate to adjust

for preinstruction differences between groups.

Tables 1 through 5 present the results of these analyses for the fifth grade mathematics program. Examination of these tables will show that significant improvement and differences were found for the pilot group in the fifth grade mathematics program.

Table 1

Grade Five Total Mathematics Test:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	65.2499	60.9999	63.7567
Posttest	68.9166	60.9230	66.1080
Adjusted Posttest	67.9079	62.7851	
F = 4.0783		$p > .01$	

Table 2

Grade Five Basic Addition Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	19.2916	18.8461	19.1351
Posttest	19.2499	19.3846	19.2972
Adjusted Posttest	19.2212	19.4358	
F = .5898		$p < .10$	

Table 3

Grade Five Basic Subtraction Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	18.9999	18.9999	18.9999
Posttest	19.6249	18.5384	19.2431
Adjusted Posttest	19.6249	18.5384	
F = 4.0596		p> .01	

Table 4

Grade Five Computation Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	15.8750	13.2308	14.9459
Posttest	16.5416	12.5385	15.1351
Adjusted Posttest	15.9260	13.6748	
F = 2.3979		p> .02	

Table 5

Grade Five Story Problems Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	11.3333	9.9231	10.8378
Posttest	13.5000	10.4615	12.4324
Adjusted Posttest	13.1945	11.0255	
F = 2.4656		p> .01	

Results for Fifth Grade Reading

Tables 6 through 9 present the results of the pilot project in the area of reading. Results were looked at for total test differences along with three subareas of root words, prefixes, and suffixes.

The reading effort was the shortest intervention program of all areas included in this pilot project. This program was implemented for approximately three weeks. Examination of Tables 6 through 9 will show that even for short periods of time, special programs can improve test scores.

Table 6

Grade Five Total Reading Test:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	33.3749	25.3076	30.5405
Posttest	45.7916	28.3076	39.6486
Adjusted Posttest	43.7400	32.0950	
F = 4.0729		p > .01	

Table 7

Grade Five Root Words Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	12.0833	11.000	11.7027
Posttest	15.2500	10.8462	13.7027
Adjusted Posttest	15.0076	11.2935	
F = 3.5035		p > .01	

Table 8

Grade Five Prefixes Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	10.1667	6.3846	8.8378
Posttest	14.2500	7.6923	11.9459
Adjusted Posttest	13.5183	9.0431	
F = 4.2884		p > .01	

Table 9

Grade Five Suffixes Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 24	Control Group N = 13	Total N = 37
Pretest	11.1250	7.9231	10.000
Posttest	16.2916	9.7692	14.000
Adjusted Posttest	15.4827	11.2624	
F = 2.9281		p > .01	

Results for Seventh Grade Mathematics

Seventh grade students participated in the pilot effort in the area of mathematics. The program description in Section 2 presented the method by which the seventh grade subjects were introduced to the experimental program. It should be noted that the fifth and seventh grade mathematics programs differed not only in what subtests were included in the pre- and posttest situations but also in the training that the teacher involved in the program received.

The data for the seventh grade pilot study was analyzed for total test group differences and the subtest areas of computation and story problems. Tables 10 through 12 present these results.

Table 10

Grade Seven Total Mathematics Test:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 15	Total N = 23
Pretest	25.00	31.7999	29.4347
Posttest	22.8750	29.7333	27.3478
Adjusted Posttest	26.5893	27.7523	
F = .4532		$p < .10$	

Table 11

Grade Seven Computation Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 15	Total N = 23
Pretest	12.8750	16.600	15.3043
Posttest	13.0000	15.8667	14.8696
Adjusted Posttest	15.0891	14.75245	
F = .2228		$p < .10$	

Table 12

Grade Seven Story Problems Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 15	Total N = 23
Pretest	12.1250	15.2000	14.1304
Posttest	11.0000	13.8667	12.8696
Adjusted Posttest	12.7418	12.9377	
F = .1555		$p < .10$	

Results For Ninth Grade Social Studies

Ninth grade students were used to test the effectiveness of the pilot study curriculum in the area of social studies. Statistical procedures were utilized to test for differences not only on overall test achievement but also in several subareas which made up the total test. The subtests included in the social studies area were vocabulary, time concepts, map skills, and content. Tables 13 through 17 present the results of the social studies pilot effort.

Table 13

Grade Nine Total Social Studies Test:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 10	Total N = 18
Pretest	11.5000	12.6000	12.1111
Posttest	21.7500	12.5000	16.1111
Adjusted Posttest	21.82964	12.43625	
F = 4.8298		$p > .01$	

Table 14

Grade Nine Vocabulary Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 10	Total N = 18
Pretest	2.5000	2.1000	2.2778
Posttest	4.2500	2.4000	3.2222
Adjusted Posttest	4.22244	2.42205	
F = 2.4652		$p > .02$	

Table 15

Grade Nine Time Concepts Subtest:
Pre-, Post-, and Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 10	Total N = 18
Pretest	2.2500	2.5000	2.3889
Posttest	3.7500	2.9000	3.2778
Adjusted Posttest	3.75771	2.89382	
F = 2.7790		$p > .01$	

Table 16

Grade Nine Map Skills Subtest:
Pre-, Post-, Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 10	Total N = 18
Pretest	3.2500	4.2000	3.778
Posttest	9.000	3.4000	5.8889
Adjusted Posttest	9.19180	3.24656	
F = 5.5331		$p > .01$	

Table 17

Grade Nine Content Subtest:
Pre-, Post-, Adjusted Posttest Means
For Experimental and Control Groups

$\bar{X}$	Experimental Group N = 8	Control Group N = 10	Total N = 18
Pretest	3.5000	3.8000	3.6667
Posttest	4.7500	3.7000	4.1667
Adjusted Posttest	4.70274	3.73780	
F = 1.1798		$p < .05$	

SECTION FOUR

Questionnaire Results

In an effort to investigate how the new materials were received by the students in the pilot study, a short questionnaire was administered following the conclusion of the project. The experimental groups of fifth, seventh, and ninth grade students participating in the program completed the questionnaires. The forms were similar for all grade levels with minor changes to reflect the nature of the subjects which were being investigated. The questionnaires were designed to elicit feedback for the teachers so they could discover student attitudes and areas of concern for further development of the project.

Although no statistical analyses were computed with the resultant data the responses proved interesting. Across all grade levels, typical responses were found to questions suggesting "liking of school and academic subjects". However, responses to new materials and teaching techniques used were overwhelmingly favorable. It is also interesting to note that in the seventh grade class where the teacher did not receive training student rating of the program efforts and materials was not as high as it was with the fifth and ninth grades where teachers did receive training.

STUDENT QUESTIONNAIRE

Mathematics Fifth Grade

N = 24 (Experimental Group)

*Questions concerning newly developed materials and strategies.

QUESTIONS:	YES	NO	NOT SURE
1. I like school.	58%	13%	29%
2. I like math.	70%	17%	13%
3. I am good at addition.	63%	0%	37%
4. Math is hard for me.	4%	63%	33%
5. I make mistakes in addition.	46%	41%	13%
6. Subtraction is easy for me.	54%	25%	21%
7. I have trouble borrowing in subtraction.	29%	50%	21%
8. I need extra help in math.	29%	37%	34%
9. I know how to work multiplication problems.	29%	21%	50%
10. Multiplication is hard for me.	29%	42%	29%
*11. I like story problems.	71%	21%	8%
12. Math class bores me.	21%	33%	46%
13. I know how to do division.	33%	25%	42%
14. I am afraid of math.	12.5%	75%	12.5%
*15. I liked the math packets about catalog ordering.	100%	-	-
*16. I worked on the big shade-in picture in math class.	58%	5%	37%
*17. I got to use Dataman in class.	50%	25%	25%
*18. I liked the math puzzles.	83%	8.5%	8.5%
*19. I would like more math puzzles.	87.5%	-	12.5%
*20. I liked to learn how to write a check.	92%	4%	4%
*21. I liked the big math picture we did in class.	87.5%	4%	8.5%
*22. I like math homework.	50%	37%	13%

STUDENT QUESTIONNAIRE

Fifth Grade Reading
May 10, 1979

N = 24 (Experimental Group)

*Questions concerning newly developed materials and strategies.

QUESTIONS:	YES	NO	NOT SURE
1. I like school.	50%	41.66%	45.83%
2. I like to read.	71%	4%	25%
3. I am good at reading.	25%	16%	58%
4. Reading is hard for me.	8%	71%	21%
5. I need extra help in reading.	21%	54%	55%
6. I like to read stories.	83%	4%	13%
7. I like to have the teacher read to us.	35%	42%	25%
8. I am afraid of reading.	4%	88%	8%
9. Reading class bores me.	50%	25%	25%
*10. I liked the reading packets about root words.	67%	16%	16%
*11. I liked the reading packets about the prefixes.	71%	12%	17%
*12. I liked the reading packets about suffixes.	54%	33%	13%
*13. I liked the reading puzzles.	92%	8%	0%
*14. I liked reading about the Basket-makers.	76%	8%	16%
*15. I like reading better after doing this reading unit.	41.6%	17%	42%
*16. I would like more reading packets.	63%	29%	8%
*17. I would like more reading games and puzzles.	88%	4%	8%

STUDENT QUESTIONNAIRE

Seventh Grade Mathematics

N = 13 (Experimental Group)

*Questions concerning newly developed materials and strategies.

QUESTIONS:	YES	NO	NOT SURE
1. I like school.	69%	8%	23%
2. I like math.	38%	31%	31%
3. I am good at addition.	85%	0%	15%
4. Math is hard for me.	8%	46%	46%
5. I make mistakes in addition.	23%	38%	38%
6. Subtraction is easy for me.	69%	8%	23%
7. In subtraction I have trouble borrowing.	15%	62%	23%
8. I need extra help in math.	8%	46%	46%
9. I know how to work multiplication problems.	85%	0%	15%
10. Multiplication is hard for me.	8%	62%	31%
11. Math class bores me.	46%	31%	23%
12. I would like to take algebra.	46%	31%	23%
13. I am afraid of math.	8%	85%	8%
*14. I liked the math packets about Pueblo Buying and Selling.	38%	31%	31%
*15. I worked on the shade-in mural in math class.	64%	23%	23%
*16. I enjoyed the math packet about writing checks.	77%	15%	8%
*17. I got to use Dataman in class.	77%	31%	15%
*18. I liked the math puzzles.	77%	8%	15%
*19. I would like more math puzzles.	38%	31%	31%
*20. I liked the math mural we did in class.	31%	38%	31%
*21. I liked the Mind Snaggers.	38%	46%	15%
*22. I would like to take more math in high school.	62%	8%	31%

STUDENT QUESTIONNAIRE

Ninth Grade Social Studies

N = 9 (Experimental Group)

*Questions concerning newly developed materials and strategies.

QUESTIONS:	YES	NO	NOT SURE
1. I like school.	55%	-	44%
2. I like studying history.	66%	-	33%
3. I am a good student in history.	11%	-	88%
4. History classes are hard for me.	11%	55%	33%
5. I know how to make outline notes for history class.	22%	11%	66%
*6. I have trouble making an outline for my class notes.	22%	33%	44%
*7. I need extra help in learning how to outline.	11%	11%	77%
*8. I know how to make a timeline.	66%	-	33%
*9. Making timelines is hard for me.	-	55%	44%
*10. I can locate prehistoric cultural areas on a map of the southwest.	22%	-	77%
*11. I can identify major rivers and prehistoric sites on a map of the southwest.	22%	-	77%
*12. Learning the Keresan names of the items we studied in class was hard for me.	33%	66%	-
*13. I need more help in learning my Keresan language.	33%	22%	44%
*14. Learning the English vocabulary for this unit helped me understand the Pueblo history material better.	77%	11%	11%
*15. I like studying about my Pueblo history.	88%	-	11%
*16. I like studying about my Keresan language.	88%	-	11%
*17. I know how science has helped to tell me more about my Pueblo history.	44%	22%	33%

QUESTIONS (Cont'd)	YES	NO	NOT SURE
*18. I know some of the legends that our own people tell of our Pueblo history.	55%	11%	33%
*19. I liked the group learning activities that were done in class like the Basket Maker Menu activity.	88%	-	11%
*20. I got to work on the Basket Maker Menu activity in class.	88%	-	11%
*21. I got to work on the Chaco Canyon Newspaper activity in class.	66%	11%	22%
*22. I would like to do more learning activities like we did in class.	88%	-	11%
*23. I liked the field trips that the Keresan class took.	88%	-	11%
*24. I would like to take more field trips.	100%	-	-
*25. I know who the ancestors of the Pueblo people are.	55%	11%	33%
*26. I like having community people come into the classroom to teach me about my Pueblo history and culture.	100%	-	-
*27. I know how pottery is made	55%	-	44%
*28. I got to make pottery in class	100%	-	-
*29. I know the Keresan names for the items used in pottery making.	33%	11%	55%
*30. I liked the movies and filmstrips we saw in class.	100%	-	-
*31. I would like to continue learning about my Pueblo's history in school.	77%	-	22%
*32. I like history better after having studied about my Pueblo history.	77%	-	22%
33. After studying this unit on Pueblo history, I would like to take more history classes.	22%	11%	66%

SECTION FIVE

Discussion and Overview

The pilot project attempted to investigate whether new curriculum efforts could be successful in improving academic achievement of Pueblo Indian students enrolled in a conventional school system. The major premise of this undertaking was that Pueblo Indian students are at a disadvantage when it comes to traditional educational practices because of their particular cultural perspectives, possible language and conceptual differences, and the relevance of classroom materials. To counteract the conventional pitfalls, the pilot study attempted to tailor curriculum materials for these students and to provide teacher training in the use of new materials to facilitate better understanding.

After inspection of the data collected and analyses computed the pilot project has been considered successful. In almost every case where the materials were used correctly and the teacher received training the program produced significant differences between the experimental group students and their conventional counterparts.

Results of analyses of the data, collected in the fifth grade mathematics program, produced significant

results in all but one subtest. Significant improvements and differences were found for the pilot group on the total test scores and the subtests of subtraction, computation of money amounts, and story problems. The area of addition was the only subtest section for which no statistical significance was found. In light of the highly significant results in all other areas it is hypothesized that addition at this level is a more easily learned and utilized concept. Also it was considered that perhaps addition concepts have been utilized more frequently by both groups than the other areas so that although the pilot group made greater gains than the control group this improvement was not found to be statistically significant.

Students in the fifth grade also were used for testing curriculum materials in the area of reading. For reasons already discussed (see the program descriptions in Section 2) the reading effort centered around the learning of root words, prefixes, and suffixes. Results for these three areas and total test scores were all found to be statistically significant. What was especially interesting about the reading program was that the ability to produce highly significant gains was accomplished in only a three week period. This finding would indicate that it might not be necessary for minority children to score far below national means

on standardized tests. If a three week effort with tailored materials can produce significant gains then special programs from the beginning of school should be able to improve the standing of Indian children on test scores. A concerted effort should be made to develop other pilot projects to investigate this concept.

In contrast to the fifth grade mathematics study the seventh grade produced no significant differences or improvements. However the seventh grade mathematics program was conducted somewhat differently than the other portions of this project. The experimental group teacher in the seventh grade section was allowed to use the new curriculum materials but did not receive any training. It would appear from these results that the teacher training portion of this program is an important component, since both fifth and ninth grade programs resulted in highly significant gains where new materials and teacher training were combined.

It is possible that new materials in the hands of conventional teachers, without training, will produce conventional results. Conventional teachers may teach in conventional ways regardless of materials and possibly the materials will be personally modified to match established patterns of instruction.

The results of the pilot project with the ninth grade students were especially enlightening. The ninth

grade effort was conducted in the area of social studies; specifically the test was composed of areas which included vocabulary, time concepts, map skills, and content.

The analyses performed on this data found significant improvements in all areas except content. Inspection of the means (presented in tables 13-17) shows that the experimental group at least doubled their scores in almost every instance. The importance of this finding is that significant gains can be influenced not only in primary grades but in the later grades as well. It is also important to note that not only did the pilot project succeed with the ninth graders but the most dramatic numerical gains were found in the ninth grade program at the conclusion of the project.

The data for this project was analyzed in a stepwise fashion from fifth to ninth grade. When significant results were not found in the seventh grade the hypothesis that our efforts were "too little, too late" was considered. Initially it was felt that such a short program after seven years of school might not be feasible. However, analyses performed subsequently with the ninth grade data dispelled this concern. Since the ninth grade results are so highly supportive of the program the logical answer to the lack of gains in the seventh grade points to the variable of teacher training.

In future studies it is suggested that more attention be given to teacher training. The findings in this study point out that teacher training might be a special variable which appears to need close scruitiny in an effort to enable these populations of students to produce work at their true levels of potential.

Although this pilot project was relatively short in duration it produced several statistically significant findings. The findings indicate that gains can be accomplished with well thought out curriculum materials if teachers have access to relevant tools and receive adequate training in their usage. It would appear that a more concerted effort should now be undertaken to initiate similar programs on a broader scale to verify these results and further refine portions of the program. Furthermore it would seem that this "common sense" approach to curriculum development may prove helpful to other professionals involved in curriculum development for bilingual/bicultural students. Moverover, in future curriculum improvements it is hoped that the results of this pilot study will continue to benefit Pueblo Indian students.